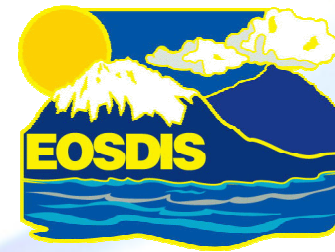


# Earth Science Data and Information System (ESDIS) Project

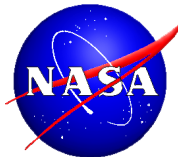


**Jeanne Behnke**  
**LP DAAC Users Working Group**  
**August 11, 2010**

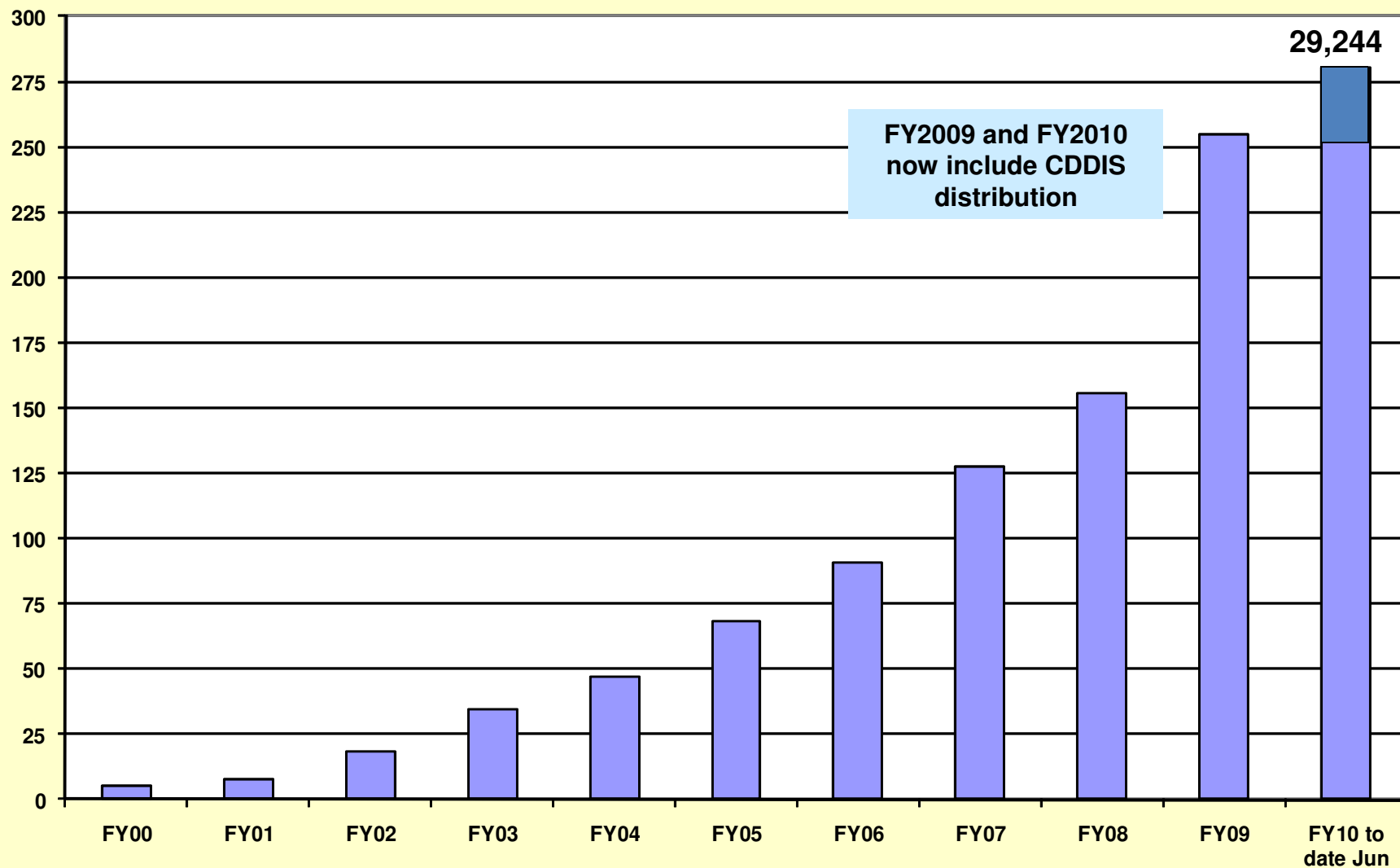




# EOSDIS Products Delivered: FY00 thru June 2010



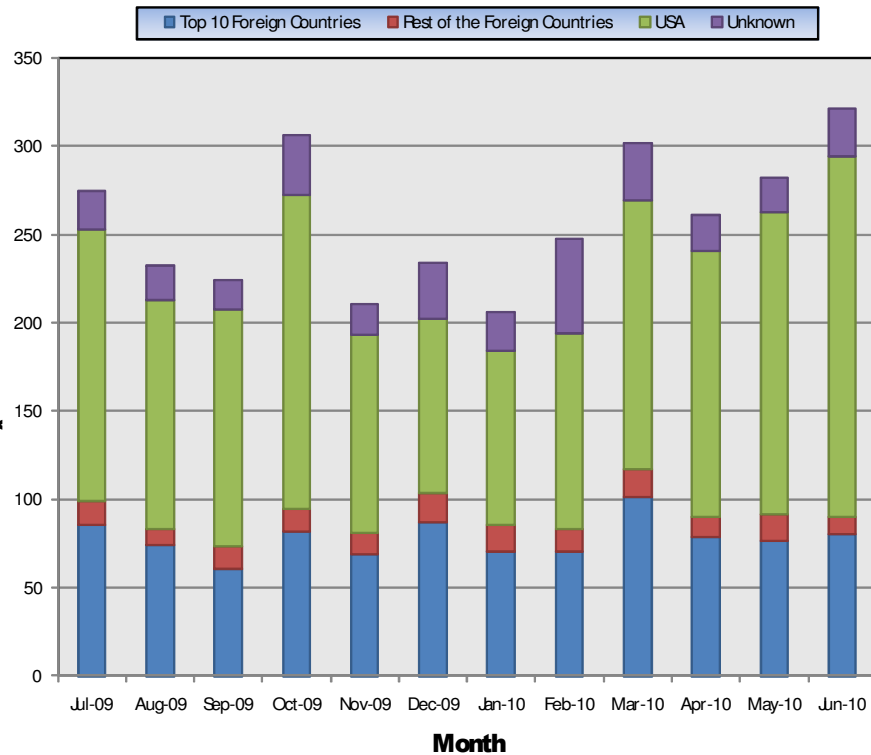
(in Millions)



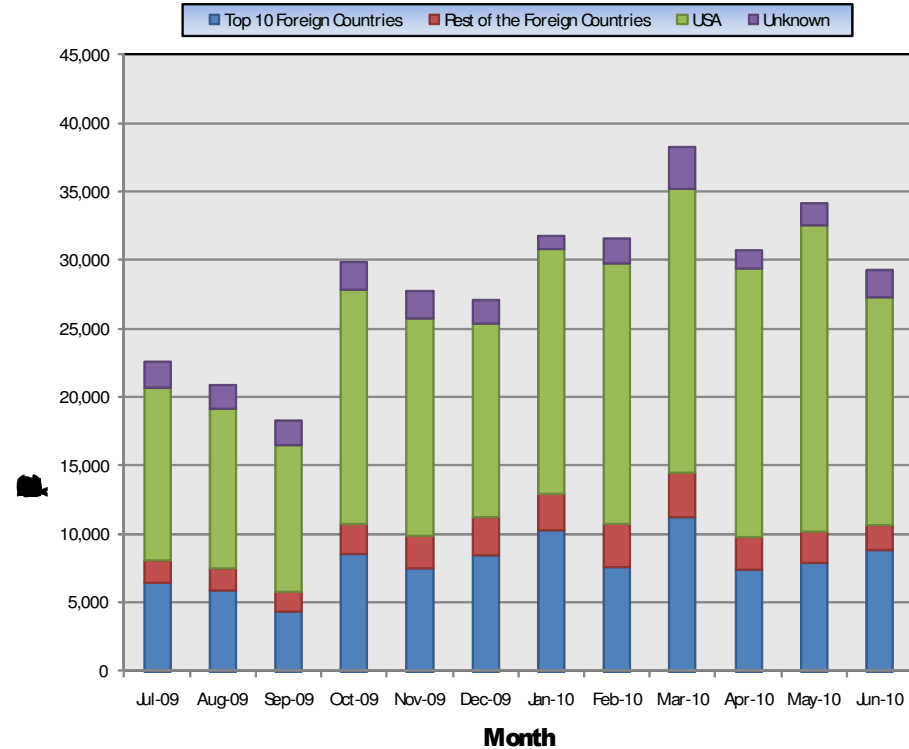
# Monthly Distribution to Users (Jul 2009 – Jun 2010)



**Monthly Distribution to Foreign and US Users  
(Jul 2009 - Jun 2010)**



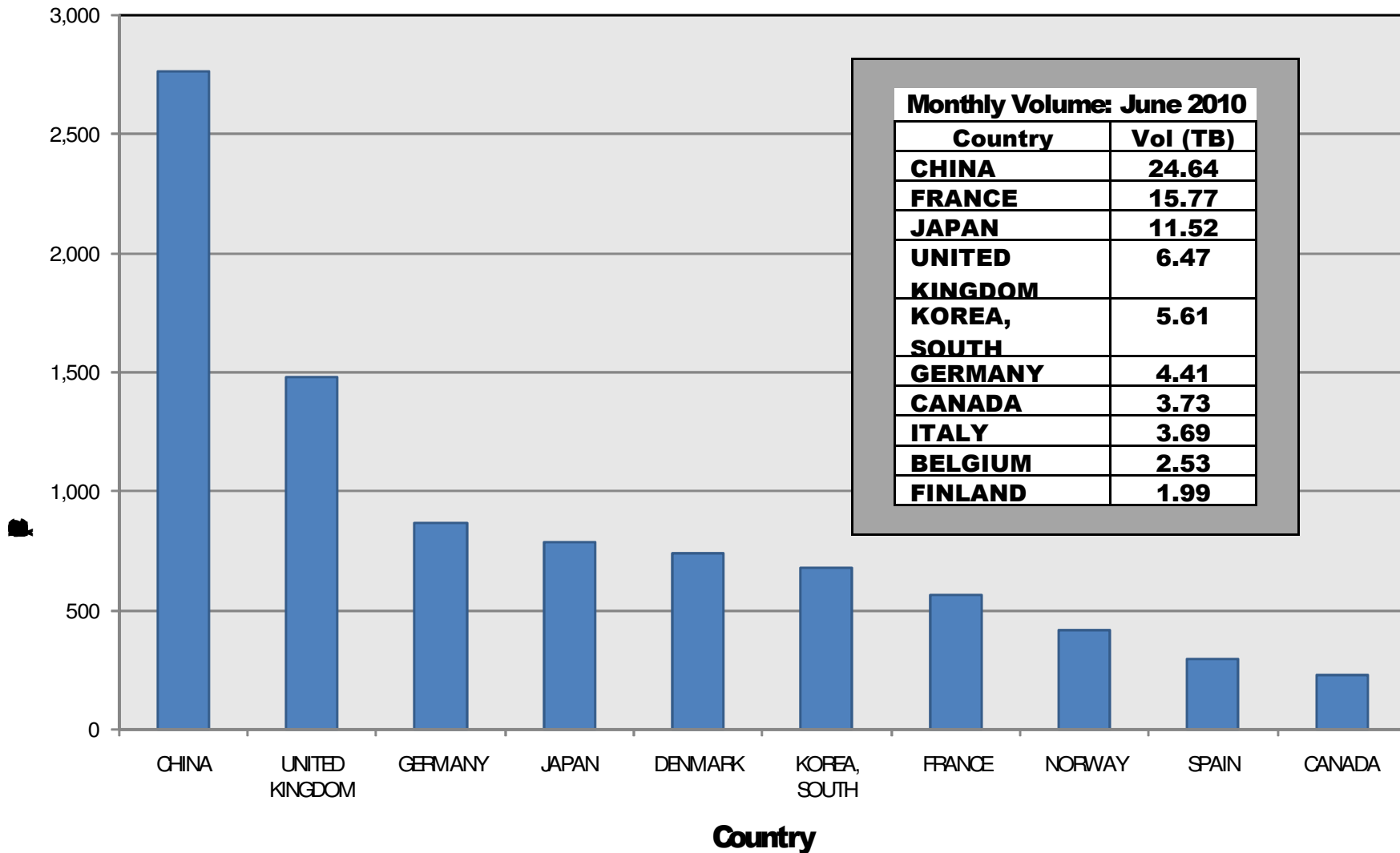
**Monthly Distribution to Foreign and US Users by Product  
(Jul 2009 - Jun 2010)**



# Monthly Products/Volume Distribution (June 2010)



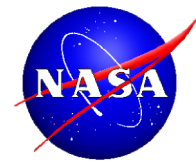
## Monthly Distribution to Top 10 Countries by Product (Jun 2010)



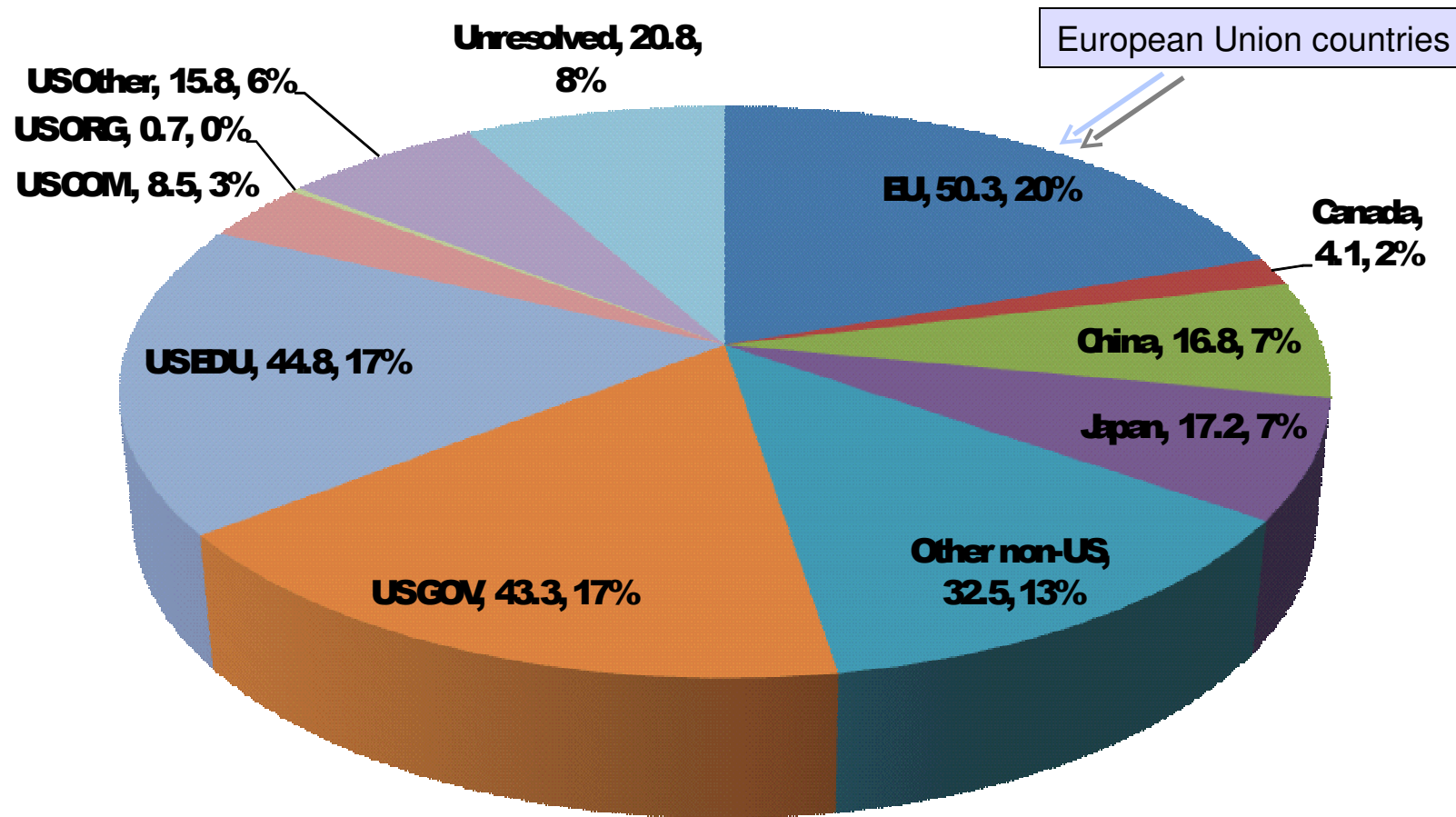
08/17/10

Maiden

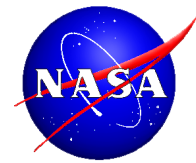
# EOSDIS Data Distribution in FY09



**Number of Products Distributed in FY09 (Millions)**

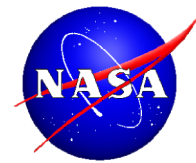


# Earth Science Data and Information System (ESDIS) Project

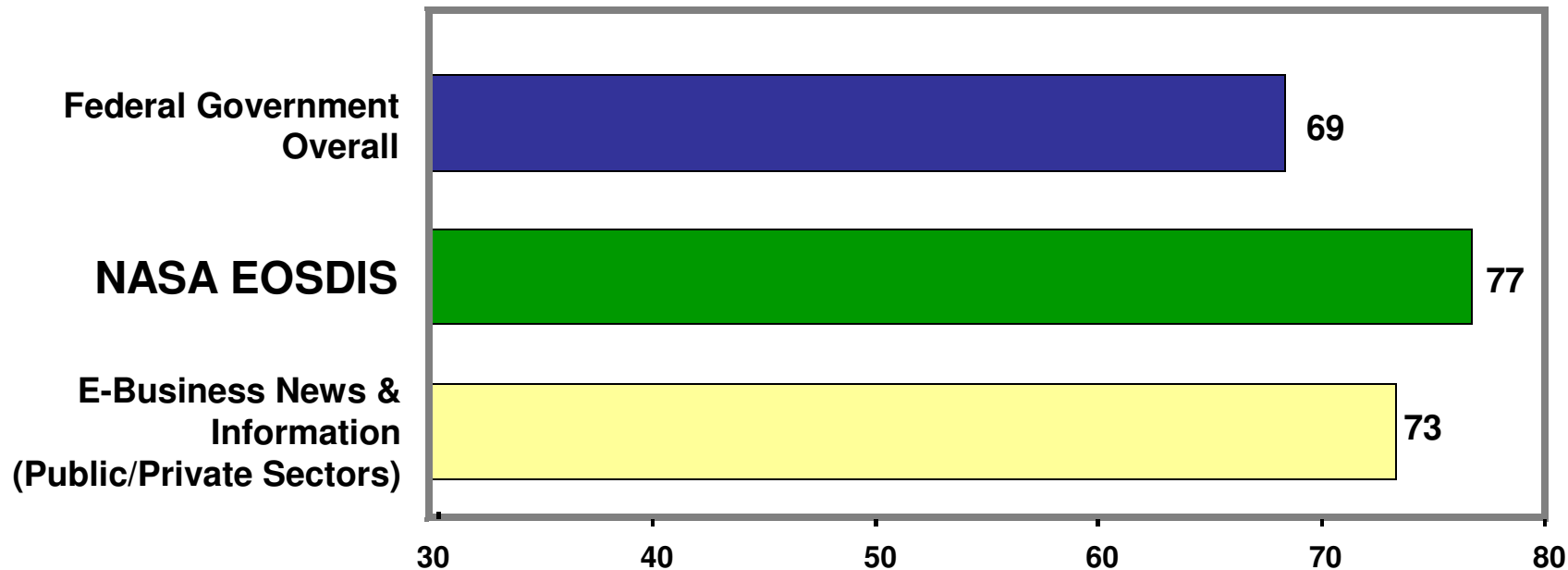


| FY09 Metrics                                | EOSDIS     | LP DAAC     |
|---|------------|-------------|
| Unique Data Products                        | > 4000     | 119         |
| Distinct Users of EOSDIS Data and Services  | > 910K     | ~8,542      |
| Web Site Visits of 1 Minute or more         | > 1M       | 34,900      |
| Average Daily Archive Growth                | 1.8 TB/day | .28 TB/day  |
| Total Archive Volume                        | 4.2 PB     | ~760 TB     |
| End User Distribution Products              | > 254M     | 38.8M       |
| End User Average Daily Distribution Volume  | 6.7 TB/day | 1.48 TB/day |
| American Customer Satisfaction Index (ACSI) | 77         | 75          |

# EOSDIS ACSI Customer Satisfaction Survey 2009: Relative Rankings



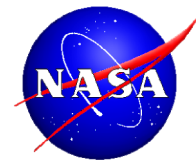
- EOSDIS sponsors an annual independent customer survey in conjunction with the American Customer Satisfaction Index (ACSI).
- EOSDIS consistently exceeds the Federal Government average
- Ratings in the mid to upper 70s are considered “very good” by the rating organization, the CFI Group
- 2009 Survey results based on 3842 responses (10%)



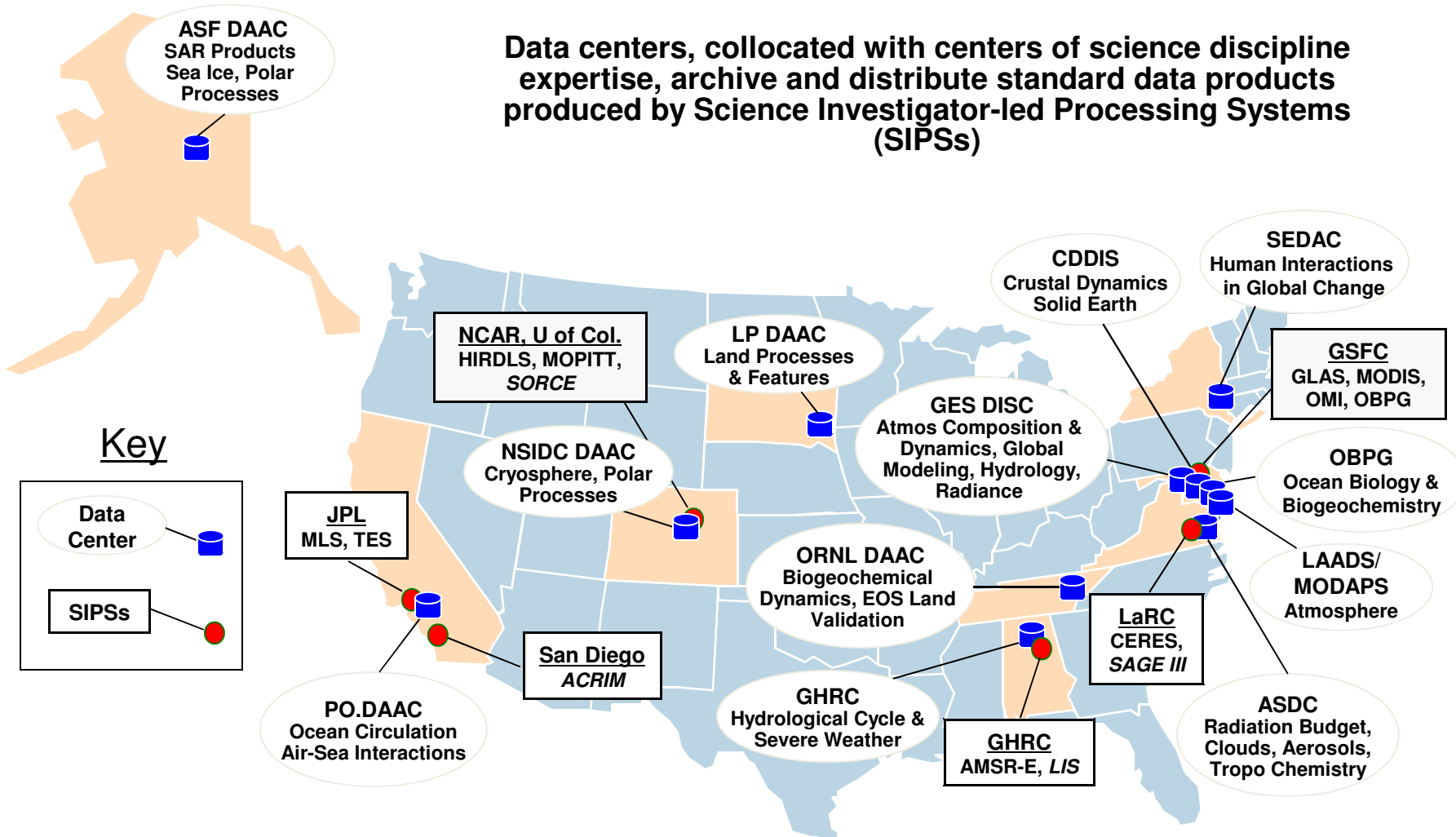
*LP DAAC score was 75 based on 1503 responses (14%)*

(11585 Invited; 916 Bounced Back ;10669 Received Invitation)

# EOSDIS Facilities

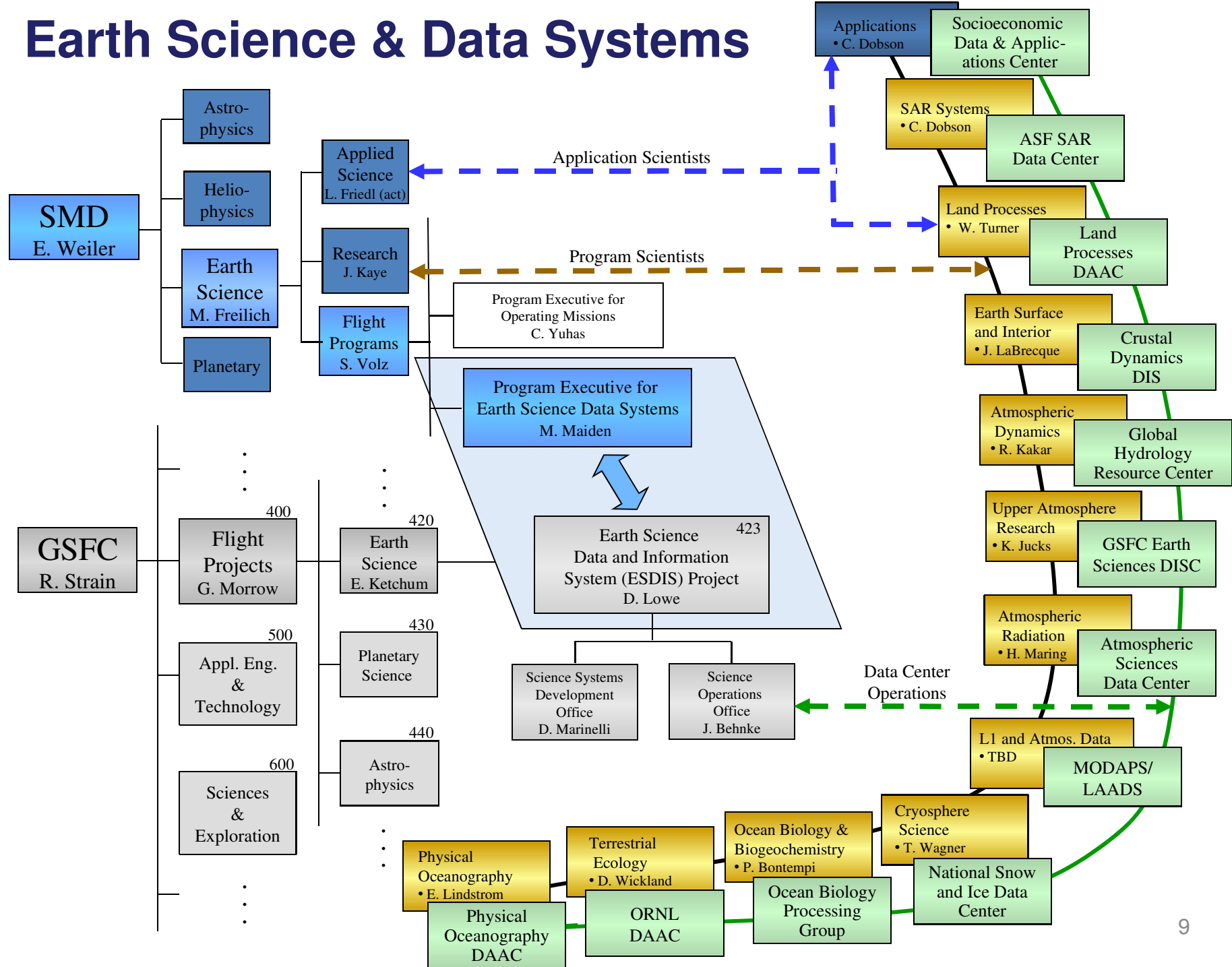


Data centers, collocated with centers of science discipline expertise, archive and distribute standard data products produced by Science Investigator-led Processing Systems (SIPs)

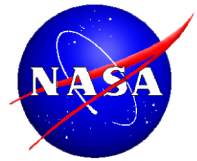




# Earth Science & Data Systems

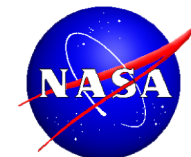


# DAAC User Working Groups



- Members represent discipline interests of the diverse user community.
- Purpose of the UWGs are:
  - provide guidance on DAAC data management priorities and science goals
  - provide oversight and guidance on DAAC activities, including data set acquisition, development of value-added products, user support, development activities, and operational functions
  - provide recommendations for annual work plans and long-range planning

# Spatial Data Access Tool (SDAT) from ORNL



**DAAC** for biogeochemical dynamics  
DISTRIBUTED ACTIVE ARCHIVE CENTER Oak Ridge National Laboratory

[+] Home >> [+] World map of the Koppen-Geiger climate classification >> World map of the Koppen-Geiger climate classification [+] Help

**Detailed Metadata**

- Collection: World map of the Koppen-Geiger climate classification
- Native Projection: WGS 84 (EPSG:4326)
- Spatial Extent: N: 90.0, S: -90.0, E: 180.0, W: -180.0
- Map Units: degrees
- Resolution: 0.1, 0.1
- Start DateTime: N/A
- End DateTime: N/A
- Data Units: no unit
- Scale Factor: 1

**Data Customization and Download**

Coverage: World map of the Koppen-Geiger climate classification

**OGC WMS map**

Use to select a region as the spatial extent to subset data  
Select Region function activated

Projection: WGS 84 [?] Spatial Extent: 45

Resolution: (x, y) 0.1 0.1 -131.5 32

Format: GeoTIFF (BYTE) -59.499999

Time: All

Bands: All

**Many Download Options**

**OGC WCS Download**

OGC WCS Requests:

- [+] Show GetCapabilities
- [+] Show DescribeCoverage
- [+] GetCoverage Request

OGC WMS Requests:

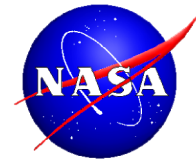
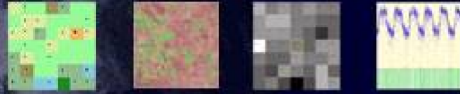
- [+] Show GetCapabilities
- [+] GetMap Request

**Legend of Map**

- 1 - Af: Tropical/Rainforest
- 2 - Am: Tropical/Monsoon
- 3 - Aw: Tropical/Savannah
- 4 - BWh: Arid/Desert/Hot
- 5 - BSk: Arid/Desert/Cold
- 6 - BSh: Arid/Steppe/Hot
- 7 - BSk: Arid/Steppe/Cold
- 8 - Csa: Temperate/Dry\_Summer/Hot\_Summer
- 9 - Csb: Temperate/Dry\_Summer/Warm\_Summer
- 10 - Csc: Temperate/Dry\_Summer/Cold\_Summer
- 11 - Cwa: Temperate/Dry\_Winter/Hot\_Summer
- 12 - Cwb: Temperate/Dry\_Winter/Warm\_Summer
- 13 - Cwc: Temperate/Dry\_Winter/Cold\_Summer
- 14 - Cfa: Temperate/Without\_dry\_season/Hot
- 15 - Cfb: Temperate/Without\_dry\_season/Warm
- 16 - Cfc: Temperate/Without\_dry\_season/Cold
- 17 - Dsa: Cold/Dry\_Summer/Hot\_Summer
- 18 - Dsb: Cold/Dry\_Summer/Warm\_Summer
- 19 - Dsc: Cold/Dry\_Summer/Cold\_Summer
- 20 - Dsd: Cold/Dry\_Summer/Very\_Cold\_Winter

- Reproject, Resample, Subset
- Download data in various file formats
- Can view map in Google Earth
- Detailed granule level Metadata
- Open Geospatial Consortium (OGC)–based
  - WMS: Web Map Server (map)
  - WCS: Web Coverage Server (data)





## MODIS Land Product Subsetting Tools

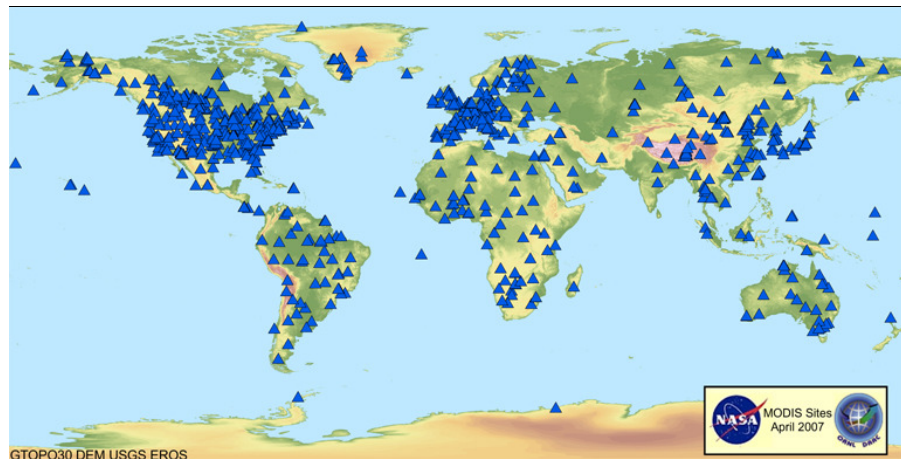
- In a scale and format (text) useful for field researchers
- Also available as image data products (GeoTIFF)

## Three methods to obtain subsets

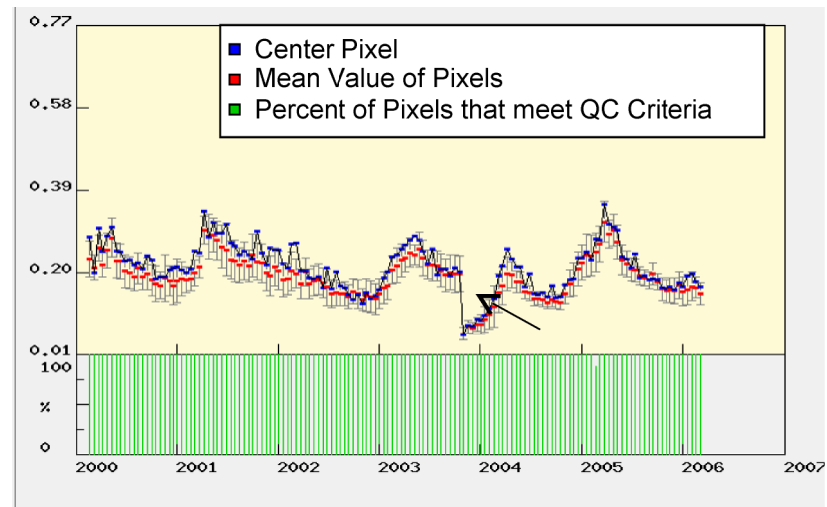
1. Fixed Site Tool - 1,152 selected sites
2. Global Tool - user selected location on demand
  - User selects product, time period, location, and area (1 pixel up to 201 x 201 km) worldwide and for user-selected time periods
1. Web Service
  - Programmatically obtain MODIS subsets for any land location, time period and area (from 1 pixel up to 201 x 201 km) using a standards based SOAP Web Service

### MODIS Land Products (C5) at ORNL DAAC

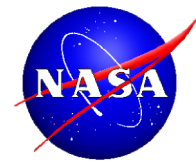
|                             |                  |
|-----------------------------|------------------|
| Surface Reflectance         | (MOD09A1)        |
| Surface Temperature         | (MOD11A2)        |
| Land Cover                  | (MOD12Q1)        |
| Vegetation Phenology        | (MOD12Q2)        |
| NDVI / EVI                  | (MOD/MYD13Q1)    |
| LAI / fPAR                  | (MOD / MYD15A2)  |
| Net Photosynthesis          | (MOD17A2)        |
| Annual NPP                  | (MOD17A3)        |
| Albedo (calc)               | (from MCD43A1,2) |
| Reflectance – BRDF Adjusted | (MCD43A2,4)      |



1,152 field sites for MODIS Collection 5



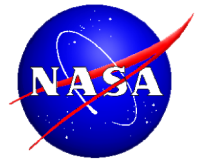
# What's Coming Up



- **Planning and implementing a Near-Real-Time Processing System to serve needs of NASA's Research, Applied Science, and Decision Support System Partners**
- **Continuing support for ASTER GDEM**
  - **Version 2 Validation Plan being drafted**
  - **Global DEM Explorer operational soon!**
- **Initial planning for long term data retention and preservation for ASTER data**
  - **ASTER US Science Team Recommendation: At the end of the mission generate Level 1B and higher level products from the Level 1A archive and archive all products**
  - **Hardware purchases for ASTER L1B archive processing**
- **Technology Infusion: Cross Archive Search, Access and Distribution Enabling MODIS and Beyond – Kicked off mid July**
- **Uniform user registration system being developed and implemented across DAACs**
- Distribution and management of MEaSURES datasets as they mature
- Continuous focus on improved EOSDIS data access and interoperability within the next year

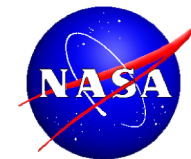
# User Registration

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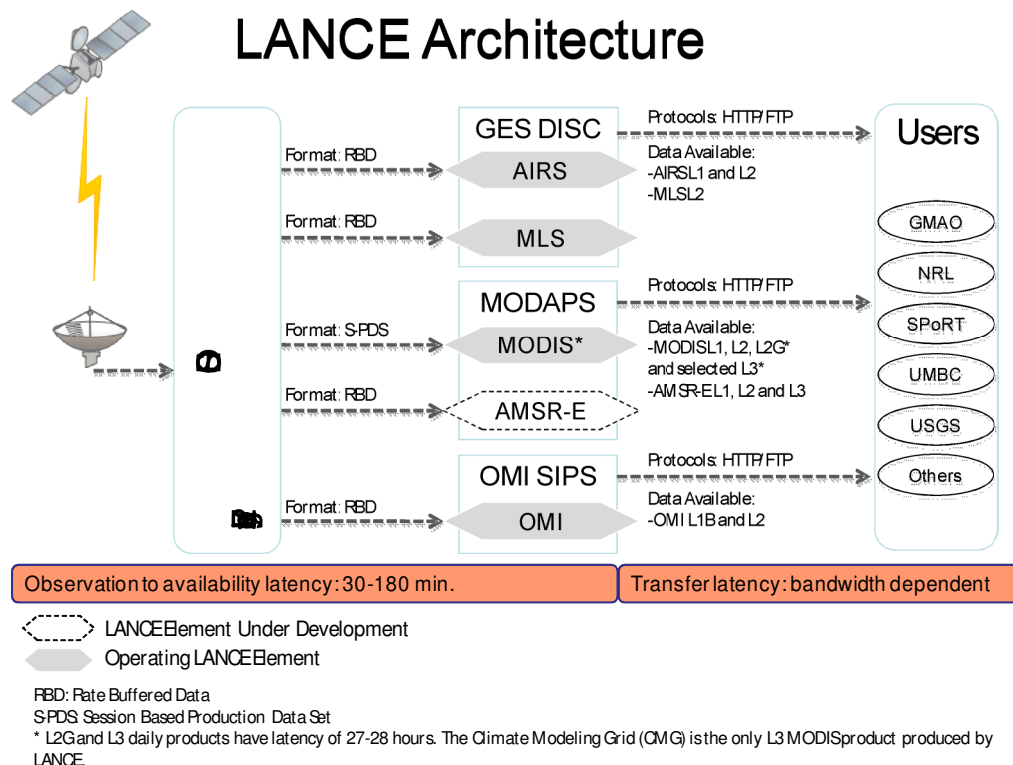


- EOSDIS will implement a system-wide user registration system in the near-term
  - One set of credentials to access data
  - Users will self-register with username and password recovery
- Prototype capability exists for the LANCE systems
- EOSDIS completed a study for the operational system

# The Land, Atmosphere Near-real-time Capability for EOS (LANCE)

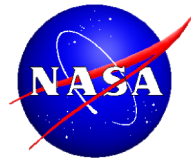


- Building on existing EOSDIS elements provides data from MODIS, OMI, AIRS, MLS, and AMSR-E instruments in near real-time (< 3 hours from observation)
- Utilizes PGE Code from Standard Science Products, but relaxes requirements for ancillary data inputs
- High operational availability
- Applications of LANCE data include:
  - Numerical weather & climate prediction/forecasting
  - Monitoring of Natural Hazards
  - Disaster Relief
  - Agriculture
  - Air quality
  - Homeland Security



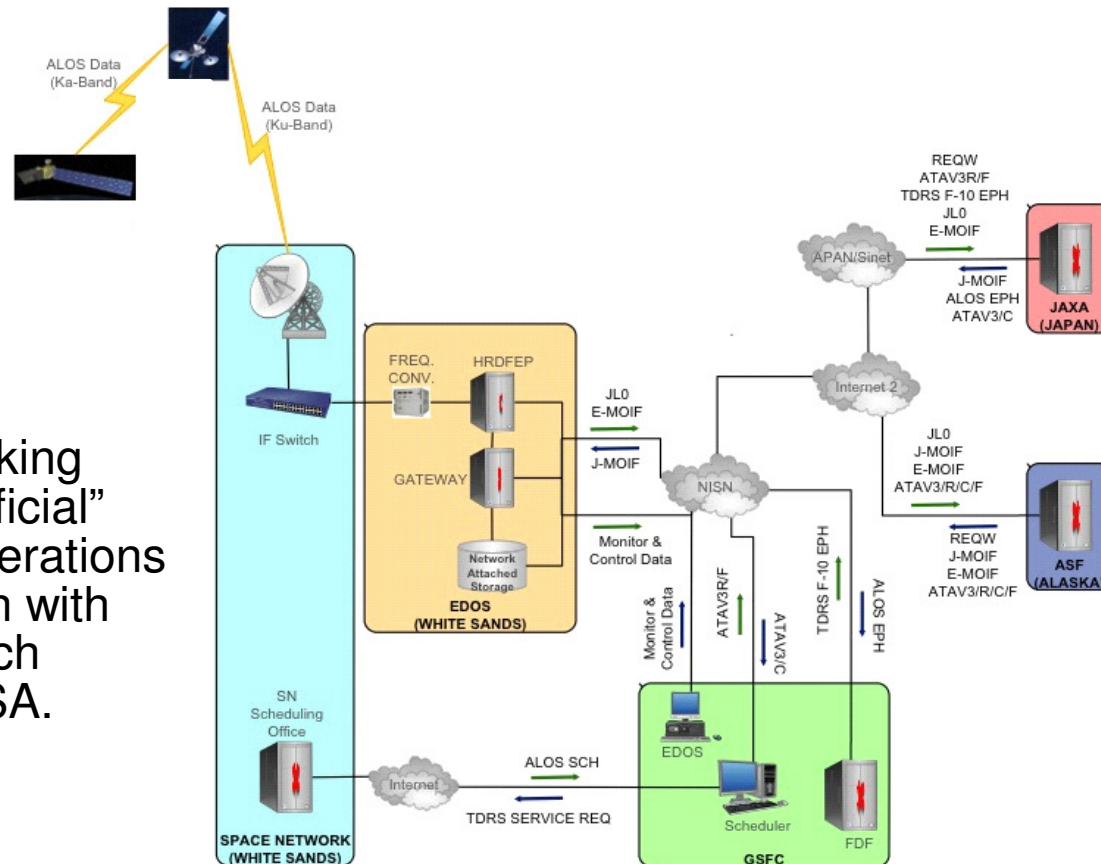


# NASA ALOS-TDRS System (NATS)



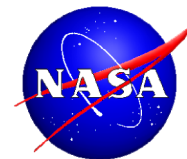
- Under ESDIS leadership, added the capability to acquire ALOS data via TDRSS Ka-band services to ensure NASA researchers have access to the Synthetic Aperture Radar (SAR) data and other data observed through the JAXA satellite

- A successful Operational Readiness Review was held March 25th.
- A ceremony marking April 12th the “Official” start of ALOS Operations was held in Japan with Dr. Michael Freilich attending for NASA.





# ECHO/WIST/GCMD Status



- ECHO employs a service-oriented architecture to provide middleware between EOS data providers and science data users:
  - Data Partners export metadata to ECHO for their Earth science-related data holdings
  - Client Partners use ECHO's open APIs to develop user interfaces
  - Science data users search ECHO's holdings and access data and services using a general purpose or tailored ECHO client
- Warehouse Inventory Search Tool (WIST): ECHO'S general purpose, web-based WIST client allows users to submit cross-discipline queries using spatial and temporal criteria
- Current Holdings:
  - 3,092 Collections, with 87 million Granules, and 57 million Browse products
  - Data Partners: ASF, GHRC, GSFC, LAADS, LARC ( ECS & ANGe), LPDAAC, NSIDC, ORNL, SEDAC, USGS/ Landsat, PO DAAC
- Enhancements status:
  - Improved operational availability by deploying a fully redundant system with automated failover
  - Developing a new general purpose web-based client employing new technology
  - Simplifying end-user Client development by providing pre-built components to allow for rapid, low cost client deployment
- Global Change Master Directory (GCMD) Holdings:
  - >30,000 descriptions of Earth science data sets, services and ancillary descriptions covering all aspects of Earth and environmental sciences
  - More active than ever....>100 portals already in use
  - URL: <http://gcmd.nasa.gov>

# Access from EOSDIS Data Centers



**USGS**  
science for a changing world

**NASA LP DAAC**  
LAND PROCESSES DISTRIBUTED ACTIVE ARCHIVE CENTER

USGS Home  
Contact USGS  
Search USGS

HOME ABOUT PRODUCTS **GET DATA** TOOLS USER COMMUNITY CUSTOMER SERVICE

Search

WIST  
GloVis  
Data Pool  
MRTWeb  
ASTER Tasking

Get Data

**Get Data**

**NASA Warehouse Inventory Search Tool (WIST)**

All LP DAAC data holdings available · Search and order earth science data from all NASA data centers · Replacement for EOSDIS Data Gateway (EDG). [More Information](#) · [Launch WIST](#)

**USGS Global Visualization Viewer (GloVis)**

All LP DAAC ASTER and selected MODIS data holdings available. Landsat 7 ETM+, Landsat 4/5 TM, Landsat 1-5 MSS, EO-1 ALI, EO-1 Hyperion, MRLC, and Tri-Decadal data sets also available. Browse-based for enhanced visualization. [More Information](#) · [Launch GloVis](#)

**LP DAAC Data Pool**

Selected LP DAAC ASTER and MODIS data holdings · Direct FTP access · All data are at no charge. [More Information](#)

Choose Data Sets

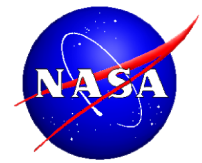
FTP directory (MODIS\_Composites/MOLA/MYD09A1.001) 2003.01.01 - 2003.01.01

64,165,372 MYD09A1.A200249.012v11.005.2002461032444.hdf  
13,939 MYD09A1.A200249.012v11.005.2002461032444.hdf.xml  
67,795,634 MYD09A1.A200249.012v12.005.200249233843.hdf  
15,091 MYD09A1.A200249.012v12.005.200249233843.hdf.xml

Data Access is available from the EOSDIS Data Center search and order sites.

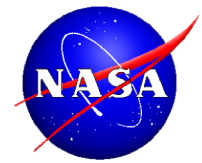
The Land Processes Distributed Active Archive Center (LP DAAC) is one of several discipline-specific data centers within the NASA EOSDIS.

# Data Preservation - Goal



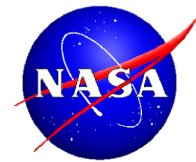
- Preserve NASA's Earth Science data for future generations
- Three different aspects of preservation need to be considered
  - Maintaining bits with no loss (or loss within acceptable bounds) as they move across systems and media, as well as over time
  - Ensuring readability over time
  - Providing for long-term understandability
- While NASA is not a “permanent archive” agency,
  - It maintains a “research archive” for as long as data are used for scientific research and/or responsibility is transitioned to permanent archives
  - Critical data are backed up off-site

# Data Preservation - Approach



- Maintain bits with no loss
  - Compute and store checksums at every stage
  - Copy data periodically into newer media and ensure that neither storage media nor readers become obsolete
- Ensure readability over time
  - Maintain currency of storage and reader hardware (as stated above)
  - Maintain format dependent read software tools and/or
  - Eliminate dependence on specialized software libraries
    - Develop machine- and human-understandable documentation of internal details of file structures to enable future users to write read software
- Providing for long-term understandability
  - Maintain documentation and ancillary data associated with data products.
  - Work out the details of these items with PIs or other key individuals well ahead of end of missions

# Major Types of Critical Data



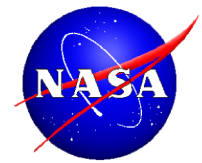
- Science observations from the NASA mission/instrument
  - The Level 0 and/or Level 1 data that can be used to develop refined Climate Data Records.<sup>1</sup>
  - Calibrated and geo-located radiance data. The definitive version of the EOS Level 1 data and any other data sets or products needed to interpret them.<sup>2</sup>
- Validation field campaign datasets and Inter-comparisons with other instruments
- Ancillary datasets (e.g., orbit and attitude data) needed to generate higher level products
- Selected derived higher-level products, applications and research results

## Footnotes:

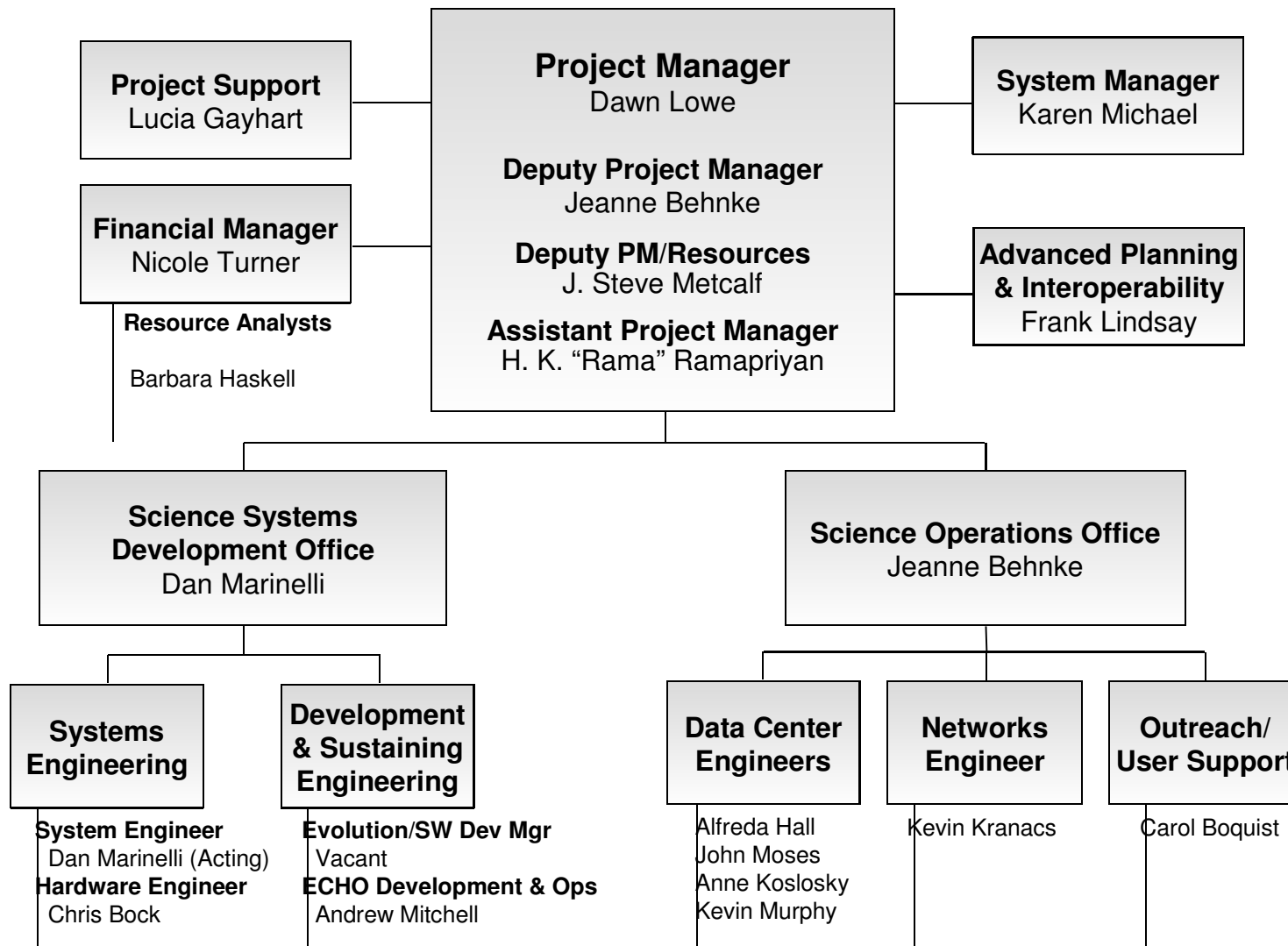
1. National Research Council. 2000. Ensuring the Climate Record from the NPP and NPOESS Meteorological Satellites, Committee on Earth Studies, Commission on Physical Sciences, Mathematics and Applications
2. Joint NASA-NOAA Workshop, USGCRP, LTA Workshop Report, 1998

# Backup

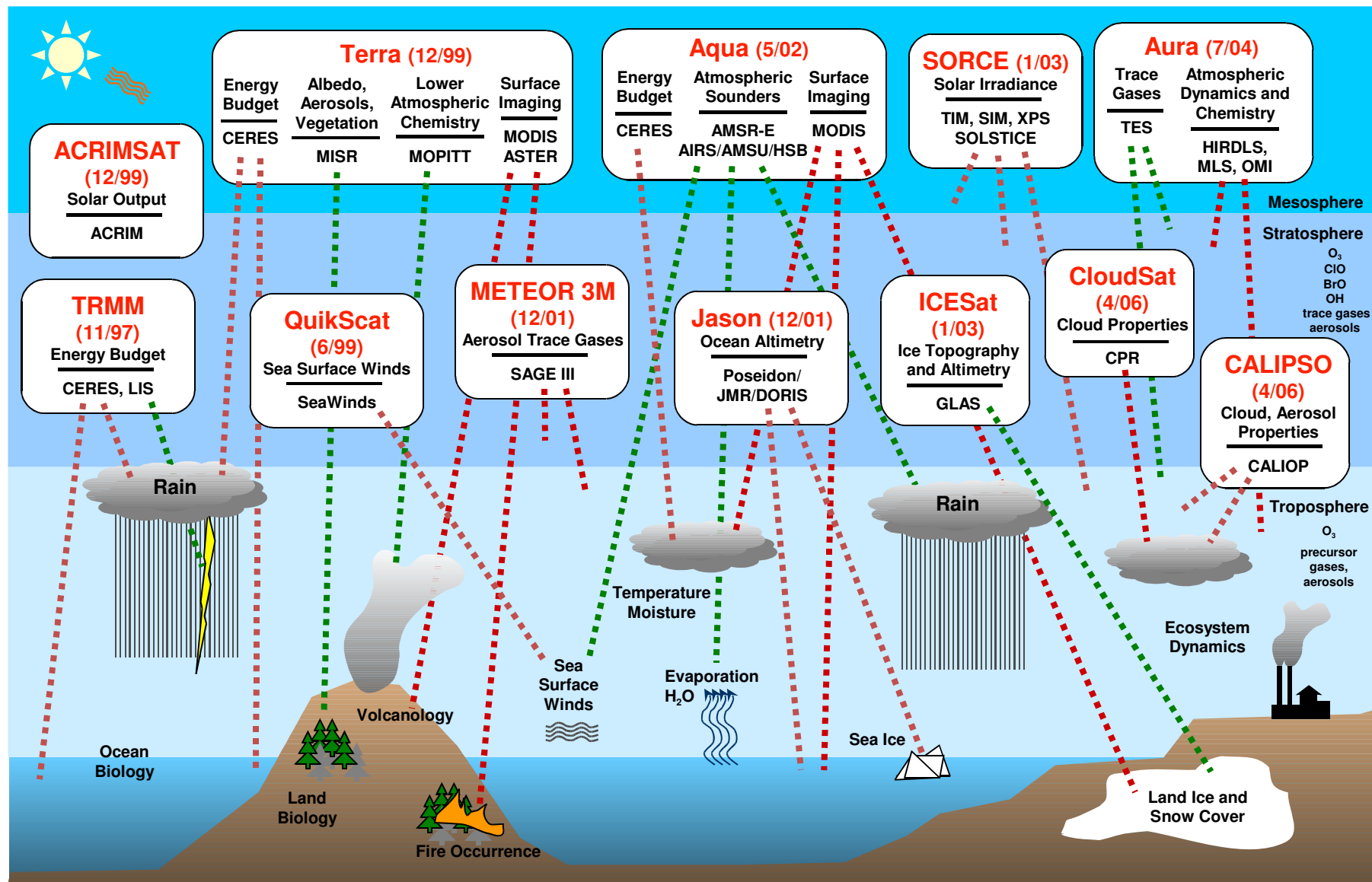
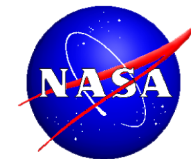
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# ESDIS Project

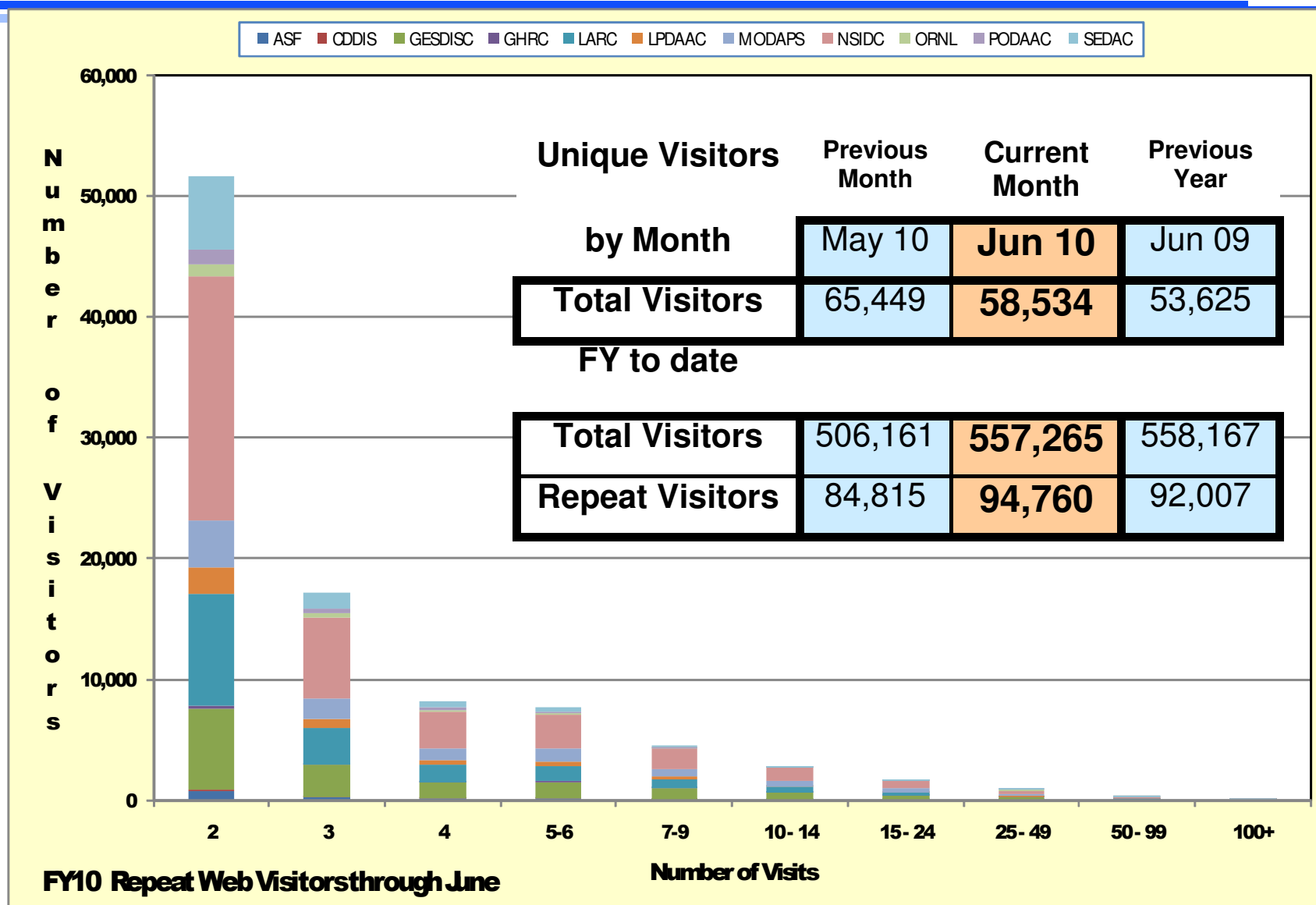


# Earth Science Measurements for Climate Change Studies

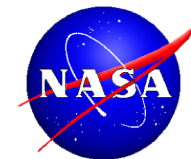




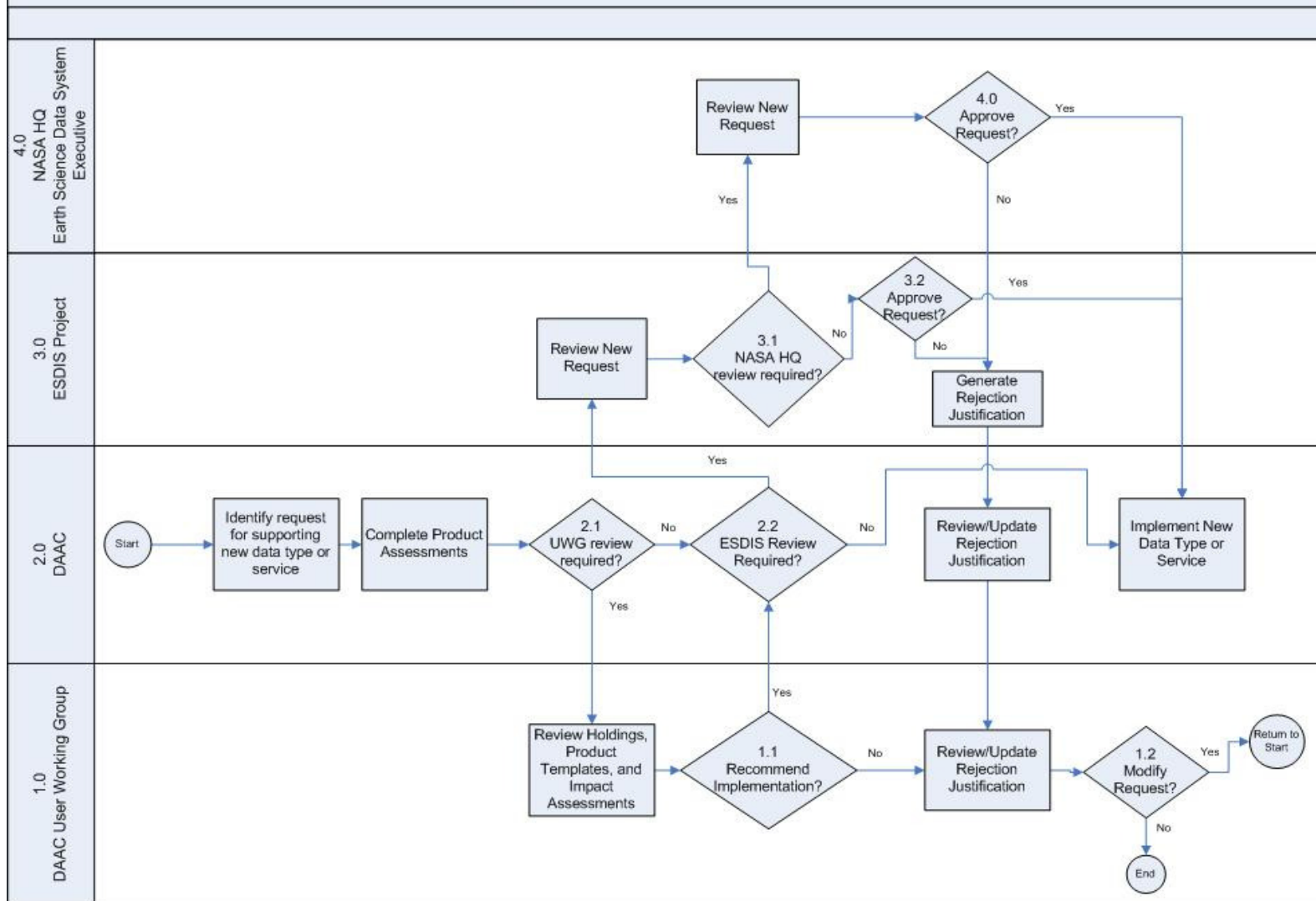
# FY2010 Data Center Web Activity – June 2010



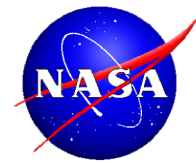
# Process Model



## DAAC Process for Implementing New Data Types and/or Services (As Is)

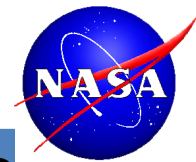


# Data Preservation Planning



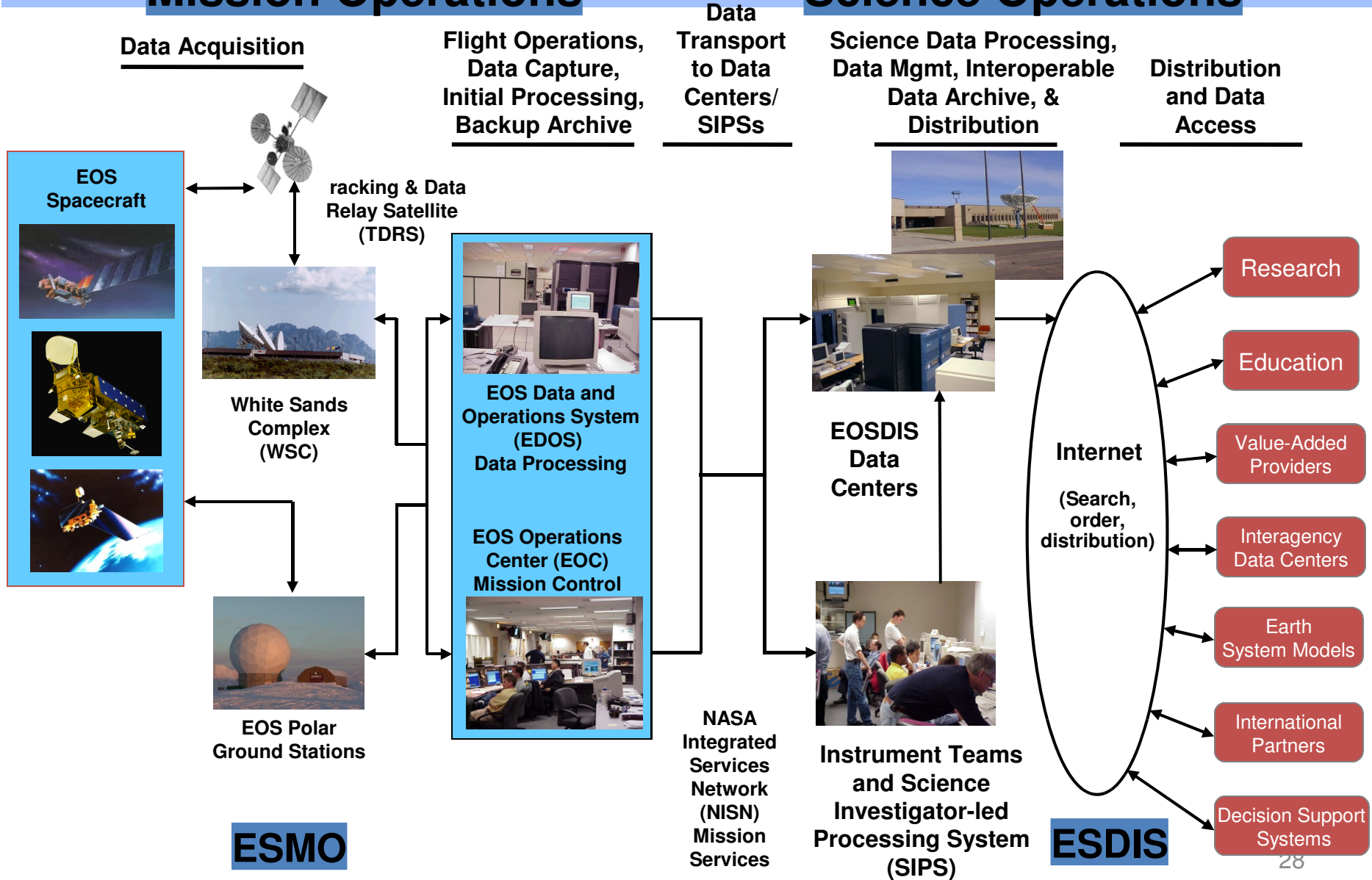
- ESDIS is preparing guidelines for long term retention and preservation of *critical EOSDIS observational records* which involves:
  - Identifying, organizing and securing the critical records of the observational data *and information* created by the distributed community of each research mission.
- Organizing the data and information for preservation *at the right time*:
  - This is the appropriate time to begin discussions of the long term retention and preservation of data.
  - Often deferred until late in the mission life so we capture validated results from the investigators.
  - But not too late - while we still have the knowledge and experience of the Principal Investigator team and science community.
  - Want to ensure the broadest possible use as a future resource.
- Documentation Criteria:
  - Enough to understand and reconstitute what happened with the dataset (e.g., production history, software build results, versions of toolkit and support libraries used)
  - Sufficient to allow regeneration of higher level science products (e.g., how-to-build handbooks, records of input auxiliary datasets, references to published verification and validation results)

# EOSDIS Context



## Mission Operations

## Science Operations



# EOSDIS Simplified Architecture

